

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 30 cancelled.

31. (presently amended) A steering system for a vehicle having first and second steerable rear-wheels, said steering system comprising:

an axle having first and second end portions which are suspended by springs and which support the first and second steerable rear-wheels of the vehicle, said axle having an intermediate portion which at least partially defines a chamber through which a longitudinal central axis of said axle extends, said first steerable rear-wheel being pivotally mounted on said first end portion of said axle for pivotal movement about a first pivot axis which extends transverse to the longitudinal central axis of said axle, said second steerable rear-wheel being pivotally mounted on said second end portion of said axle for pivotal movement about a second pivot axis which extends transverse to the longitudinal central axis of said axle;

a steering member having a longitudinal central axis, said steering member being supported in said chamber in said axle for axial-movement along a linear path relative to said axle, said steering member having a screw thread portion disposed between first and second ends of said steering member;

a ball nut associated with said screw thread portion of said steering member and disposed in said chamber in said axle;

an electric motor connected with said axle;

at least one drive member connected with said electric motor and said ball nut to rotate said ball nut to move said steering member in said chamber in said axle upon actuation of said electric motor;

a takeoff assembly connected to said first end of said steering member and having a portion projecting from an opening in said intermediate portion of said axle, said takeoff assembly being movable with said steering member along the linear path upon rotation of said ball nut;

first steering linkage connected with said projecting portion of said takeoff assembly and extending along an outer side of said axle to transmit movement of from said takeoff assembly to said first steerable rear-wheel upon movement of said steering member and said takeoff assembly along the linear path, said first steering linkage being pivotally connected to said first steerable rear wheel to effect pivotal movement of said first steerable rear-wheel about said first pivot axis upon movement of said steering member and said takeoff assembly along the linear path in said chamber in said axle; and

second steering linkage connected with said projecting portion of said takeoff assembly and extending along the outer side of said axle to transmit movement of said takeoff assembly to said second steerable rear wheel upon movement of said steering member and said takeoff assembly along the linear path, said second steering linkage being pivotally connected to said second steerable rear-wheel to effect pivotal movement of said second steerable rear-wheel about said second pivot axis upon movement of said steering member and said takeoff assembly along the linear path in said chamber in said axle.

32. (previously presented) A steering system as set forth in claim 31 further comprising a spring assembly disposed in said chamber in said axle, said spring assembly biasing said steering member toward a straight ahead position.

33. (previously presented) A steering system as set forth in claim 31 further comprising a spring assembly disposed in said chamber in said axle, said spring assembly comprises a single spring acting to bias said steering member toward a straight ahead position when said steering member is moved from the straight ahead position.

34. (previously presented) A steering system as set forth in claim 33 wherein fixed stops are disposed in said chamber in said axle and capture said spring between said fixed stops when said steering member is in the straight ahead position, said steering member having movable stops that are movable relative to said fixed stops to compress said spring upon movement of said steering member from the straight ahead position.

35. (previously presented) A steering system as set forth in claim 31 further comprising a spring assembly disposed in said chamber in said axle, said takeoff assembly comprising a piston located between said ball nut and said spring assembly, said spring assembly being effective to urge said takeoff assembly toward a straight ahead position.

36. (previously presented) A steering system as set forth in claim 35 further comprising stop means spaced apart from said piston and acting between a spring in said spring assembly and said steering member for transmitting biasing force of said spring to said steering member.

37. (withdrawn) A steering system as set forth in claim 31 further including a first spring member acting between said takeoff assembly and said axle, said first spring member biasing said takeoff assembly and thereby said steering member in a first axial direction toward a straight ahead position, and a second spring member acting between said takeoff assembly and said axle, said second spring member biasing said takeoff assembly and thereby said steering member in a second axial direction opposite the first axial direction and toward the straight ahead position.

38. (withdrawn) A system as set forth in claim 31 wherein said takeoff assembly includes a piston member connected with said steering member and supported in said axle for movement with said steering member relative to said axle, said piston member having axially opposed first and second end surfaces, a first spring member acting between said first end surface of said takeoff assembly and said axle, and a second spring member acting between said second end surface of said takeoff assembly and said axle.

39. (previously presented) A steering system as set forth in claim 31 further comprising a motor control system operative to enable the generation of back EMF in said motor upon movement of said steering member toward the straight ahead position in order to resist movement of said steering member toward the straight ahead position.

40. (previously presented) A steering system as set forth in claim 31 wherein said electric motor is located outside said chamber in said axle, said drive member extends through an opening formed in said axle.

41. (previously presented) A steering system as set forth in claim 31 wherein said steering member is free of rack teeth.

42. (previously presented) A steering system as set forth in claim 31 wherein said electric motor is effective to resist movement of said steering member toward a straight ahead position.

43. (presently amended) A system as set forth in claim 32 31 further comprising a locking member for locking said steering member in a straight ahead position.

44. (previously presented) A steering system as set forth in claim 31 wherein said drive member is a belt which extends part way around said ball nut and part way around an output member connected with said electric motor.

Claims 45 – 59 cancelled.

60. (new) A steering system for a vehicle having first and second steerable wheels, said steering system comprising:

an axle having first and second end portions which are suspended by springs and which support the first and second steerable wheels of the vehicle, said axle having an intermediate portion which at least partially defines a chamber through which a longitudinal central axis of said axle extends, said first steerable wheel being pivotally mounted on said first end portion of said axle for pivotal movement about a first pivot axis which extends transverse to the longitudinal central axis of said axle, said second steerable wheel being pivotally mounted on said second end portion of said axle for pivotal movement about a second pivot axis which extends transverse to the longitudinal central axis of said axle;

a steering member having a longitudinal central axis, said steering member being supported in said chamber in said axle for axial movement relative to said axle, said steering member being movable between a straight ahead position and positions offset from the straight ahead position of said steering member, said steering member having a screw thread portion;

a spring assembly disposed in said chamber in said axle and connected with said steering member, said spring assembly being effective to provide force which urges said steering member toward the straight ahead position when said steering member is in a position offset from the straight ahead position;

a ball nut associated with said screw thread portion of said steering member and disposed in said chamber in said axle;

an electric motor connected with said axle;

at least one drive member connected with said electric motor and said ball nut to rotate said ball nut to move said steering member away from the straight ahead position against the influence of force provided by said spring assembly upon actuation of said electric motor;

a motor control system connected with said electric motor and operative to enable generation of back EMF in said electric motor upon movement of said steering member toward the straight ahead position under the influence of said spring assembly, said back EMF generated in said electric motor being effective to oppose movement of said steering member toward the straight ahead position under the influence of force provided by said spring assembly,

a takeoff assembly connected to said steering member having a portion projecting from an opening in said intermediate portion of said axle; first steering linkage connected with said projecting portion of said takeoff assembly and extending along an outer side of said axle to transmit movement from said takeoff assembly to said first steerable wheel, said first steering linkage being pivotally connected to said first steerable wheel to effect pivotal movement of said first steerable rear wheel about said first pivot axis upon movement of said steering member and said chamber in said axle; and second steering linkage connected with said projecting portion of said takeoff assembly and extending along the outer side of said axle to transmit movement of said takeoff assembly to said second steerable wheel, said second steering linkage being pivotally connected to said second steerable wheel to effect pivotal movement of said second steerable wheel about said second pivot axis upon movement of said steering member in said chamber in said axle.

61. (new) A steering system as set forth in claim 60 wherein said first and second ends of said steering member are disposed in said chamber in said axle.

62. (new) A steering system as set forth in claim 60 wherein said electric motor is located outside said chamber in said axle, said drive member extends through an opening formed in said axle.

63. (new) A steering system as set forth in claim 60 wherein said steering member is free of rack teeth.

64. (new) A steering system as set forth in claim 60 wherein said takeoff assembly is connected to a first end of said steering member for movement therewith along a linear path.

65. (new) A steering system as set forth in claim 60 wherein said spring assembly includes only a single spring acting to bias said steering member toward the straight ahead position when said steering member is in one of said positions offset from the straight ahead position.

66. (new) A steering assembly as set forth in claim 60 wherein said spring assembly includes a first spring member acting between said takeoff assembly and said axle and a second spring member acting between said takeoff assembly and said axle.